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Applicants: Fokina E.L., Budim N.I., Chernik G.G.
Method of applying metal coatings on particles and substrates.

19 February 2003

Dear Mr. Jenkins,

Thank you for the Office communication mailed Nov 21, 2002.

We can't agree with point 5 of your letter. The objective of the patent 5 889 219 by Moriguchi et al. (prior art 1) is to provide a superhard composite member having a sufficiently dense and homogeneous structure ... and a method of manufacturing the same. In our patent the objective is to obtain a dense adherent coating with a controlled thickness on the surface of various materials ..., the coating having high degree of coverage and the process being highly productive and inexpensive. In prior art 1 (col.8, lines 55-57) it is mentioned that "the hard phase powder is coated with the binder phase powder", but no data on the quality of this coating is given. The coating obtained according to prior art 1 may have low density and very poor adhesion as it is only a step in a process of manufacturing a composite. In our case the coating obtained is characterized by high density and high value of adhesion to the surface of the coated material. The quality of the coating was checked by treating the metallized powder in an ultrasonic bath as described, for example, in our Mode 3.

The mixing in prior art 1 was performed by means of wet-blending in a ball mill for 5 hours (Test Example 1, col. 10, line 6) or for 24 hours (Test example 12, col.14, line 11). Milling in ball mills for so many hours usually introduces diamond deterioriation and contamination by iron and oxygen. In our case milling is performed for time periods which do not exceed 20 minutes. This is caused by the use of planetary mills characterized by superior energy density. The process of milling described in our case requires accelerations of planetary mills not lower than 20-30 G (where G is gravity field acceleration).

The subsequent heating to temperatures not less than 1350 °C in prior art 1 is performed with the aim of sintering the composite. In our case heating in non-oxidizing atmosphere is performed to temperatures 200-500 °C with the aim to *reduce* the material of the coating obtained in the first stage, which is a metal compound (metal oxide or metal sulfide), and produce a metal. The temperatures applied by us during metallization of a powder are dramatically lower than those described in other techniques of applying a coating (vapor-phase deposition, plasma assisted deposition,

metal bath deposition (page 1-2 of our application)). This is important for industry as it results in costs reduction.

In the case when the starting raw materials are not oxides or sulfides but metals or alloys, heating to moderate temperatures 100-300 °C is applied with the aim to remove solvent (as described in our Mode 2). In the case when dry milling is applied, heating is not needed.

We reformulated some claims taking into account your point 6.

We have left claim 5 concerning the use of treatment in organic solvents and possibility of multiple metal layers as we are supposed to provide a complete description of our process, and it is not obvious from prior art.

We edited our claims taking your suggestions into account. All the claims are discussed and edited jointly by all the applicants. We separated a first group directed at powders with the use of metal oxides and sulfides as raw materials, a second group directed at powders with the use of metals and alloys as raw materials and a third group directed at substrates according to your advice.

The edited pages 9 and 10 of our application are enclosed.

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Yours sincerely,
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